Separating the North and South Pacific Meridional Modes contributions to ENSO and tropical decadal variability

1,2Giovanni Liguori and 2Emanuele Di Lorenzo
1ARC Centre of Excellence for Climate Extremes, Monash University, Melbourne, Australia
2School of Earth and Atmospheric Sciences, Georgia Institute of Technology, Atlanta, USA
www.oceanography.eas.gatech.edu/gianni

1. Introduction

The spatial signature of the extratropical dynamics affecting ENSO is revealed by performing a simple analysis where the PC1 of OND mean SSTs in the equatorial Pacific is regressed onto preceding SST anomalies of JFM of the same year. The importance of these extratropical patterns in driving the tropical Pacific variability can be quantified using time indices for the north and south precursor patterns (i.e., Ni and Si), which are obtained by projecting extratropical JFM anomalies onto the precursor patterns, to predict the OND ENSO index (i.e., Ei).

2. The Question

What are the North and South Pacific Meridional Modes contributions to ENSO and tropical decadal variability?

3. Experiment Design

The NPMM or the SPMM variability is suppressed by restoring the SST to the monthly mean climatology only in the region where these modes are most active.
- CESM version 1
- Resolutions: 1°x1°
- Period: 1920-2005
- Forcing: Aerosol and GHG
- Restoring to monthly SST clim.

4. Results: impacts of NPMM and SPMM on ENSO

While ENSO precursor patterns in noSPMM experiment are largely unchanged, the precursor patterns for the noNPMM experiment are substantially different.

5. Results: impacts of NPMM and SPMM on TPDV

Regression maps of 8-yr low-passed SSTs with indices of the northeasterly and southeasterly trade winds strengths (NTWSi and STWSi) reveal that the STWSi presents a larger signal in the Tropics that resemble more closely the TPDV pattern.

6. Take-home messages

- The NPMM impacts the interannual (ENSO) variability of Trop. Pac. SST.
- The SPMM impacts the decadal (TPDV) variability of Trop. Pac. SST.
- Southeasterly trades play a key role in energizing the TPDV.

Geophysical Research Letters

Separating the North and South Pacific Meridional Modes Contributions to ENSO and Tropical Decadal Variability

G.L. acknowledge the support of the ARC Centre of Excellence for Climate Extremes (grant CE170100023)
E. D. L. and G. L. acknowledge the support of the NSF-OCE 1634996 and NSF-OGP 1739350
G.L. acknowledge the support of the ARC Centre of Excellence for Climate Extremes (grant CE170100023)